MEMO FOR RECORD
DATE: March 2, 2004
SUBJECT: Kennebec and Sebasticook Rivers ice conditions and installation of Kennebec River ice motion detectors, 25-25 Feb. 2004

Andy Tuthill traveled by plane to Augusta, Maine on 25 Feb. 2004 to inspect late winter ice conditions on the Kennebec and Sebasticook Rivers as part of the Ft. Halifax Dam Removal Study. In addition, on 26 Feb., I assisted Chris Williams and Tommie Hall in the installation of ice motion detectors on the Kennebec River. On 25 Feb., Bob Richter of FPL Energy accompanied me on a field inspection of ice conditions. Some of the information in this report comes from previous inspections made by Bob on 16, 21, and 26 Jan., and 10 Feb. He has provided CRREL with written reports and photos documenting his observations.

Aerial Observations
On 25 Feb., the ice cover on the Kennebec extended from Merrymeeting Bay upstream through Augusta to a point about 2 miles below Waterville. At Augusta, the textured ice surface from the freezeup ice jam of 8 Jan. was still evident beneath 10 inches of new snow that had fallen 5 days previously. Above the jam, a 1/2-mile-long open section extended from the site of the former Edwards Dam upstream to the new Third Bridge, which is under construction (Figs. 1 &2). The temporary work barges moored between the bridge piers had caused an ice cover to form upstream of the bridge and an open lead to remain downstream. Between the Third Bridge and the bend 5 miles above Augusta known as "the rips", several open leads remained in the vicinity on North Country Food Services (Figs. 3 and 4). A nearly uninterrupted ice cover extended from just above the rips, to a location about 2 miles below Waterville, near the mouth of Messalonskee Stream (Fig. 5). A narrow, half-mile long lead was visible just downstream on the North Sydney USGS Gage. Within the 2-mile-long open stretch below Waterville, a small area of ice surrounded the piers of the Donald Carter Bridge, and ice covered Teconic Bay between the mouth of the Sebasticook and the faster flowing water immediately below the Lockwood Dam (Fig. 6). Above the Lockwood Dam, the Kennebec was mostly ice covered for about 2.5 miles to the railroad bridge at Farifield, and then open for about 3 miles up to the dam at Shawmut. Above Shawmut, the river was mostly ice covered for about 25 miles to a point about 2 miles below Madison near the mouth of the Sandy River. The Kennebec was again ice covered from the dam at Madison to a point about 5 miles below the dam at Bingham.

The Sebastocook River was completely ice covered from the Ft. Fairfield Dam upstream to a 2000-ft-long open lead below the Benton Dam (Figs, 7 and 8). Above Benton, the Sebasticook the ice cover continued north as far as was visible. Below the Ft. Fairfield Dam, the Sebastcook was covered in newer gray ice that began forming in late January.

Field Observations
Ice thickness was measured on the Ft. Halifax Pool near the boat carry-in point, about 100 yards upstream of the dam. 150 ft out from the shore, the ice was 23.5 inches thick and black on the surface, indicating thermal growth. This compares to ice thicknesses of

20 and 4 inches measured on 10 Feb and 9 Jan. respectively. 75 ft out from the shore the ice was 24 inches thick, the bottom 20 being thermal ice and the top 4 inches being of snow origin. Ice thicknesses at this spot were 20 and 8 inches respectively on the previous two dates.

Near the upper end of the impoundment at the transmission line crossing about 4000 ft downstream from the Benton Dam, the ice was 26.5 inches thick and whitish in color indicating a frazil or snow ice origin.

We inspected the Ft. Fairfield Dam, which was passing flow over the central part of the spillway crest with no flow through the powerhouse (Fig. 9). The flashboards were not in use having not been repaired since damaged during previous ice breakups. We also visited the Lockwood Dam and powerhouse, inspected the ice cover on Teconic Bay and went to the site of the new Third Bridge.

On the morning of 26 Feb, I met with Andy Straz of E/PRO to discuss the status of the Ft. Halifax Dam Removal Study. Later, I met with Chris Williams and Tommie Hall and helped install the ice motion detectors. At the first ice motion detector site in Augusta, just upstream of Maine State Housing Authority, the ice was 32 and 28 inches thick, 70 and 400 ft out from the west shore respectively. The cover was rough due to its freezeup ice jam origin. We found a significant amount of frazil slush beneath the solid ice in each hole. Fig. 10 shows the ice motion detector in Augusta.

At the same time, Greg Stewart and the USGS crew accessed the river by hovercraft and the drilled six holes across the river channel about 200 ft upstream of the ice motion detector site. Stewart noted the ratios of black (thermally grown) ice to white (presumably frazil) ice, finding a surprisingly high amount of thermally grown ice in a section of river where a freezeup ice jam was observed forming on 8 Jan. 2004. He said that, statewide, although late winter ice thickness is close to normal, the USGS is finding an unusual abundance of black ice on the rivers, more than anyone remembers seeing in 10-20 years.

USGS-Measured Ice Thickness on the Kennebec River at Augusta, ME, 26 Feb. 2004

Distance from West Bank (ft)	*Ice Thickness (ft)*	*Thermal Ice/ Frazil Ice (ft)*	*Bottom of Slush (ft)*	*Frazil Slush Thickness (ft)*	*TotalWater Depth (ft)*
60	3.0	~100/0	6.5	3.5	19.0
130	2.2	~100/0	3.9	1.8	18.4
220	2.3	~100/0	3.9	1.6	15.5
300	2.3	50/50	11.0	8.7	14.5
390	2.6	50/50	11.5	8.9	11.5 *
480	2.1	~100/0	2.1	3.9	6.0

* no moving water

We installed the second ice motion detector at the Sidney boat launch, about 9 river miles upstream of Augusta (Fig. 11). Here the ice was 20-inches-thick 50 ft out from the west

shore and 24-inches-thick 150 ft out from the shore. The ice was mostly white, indicating a frazil or snow origin. No slush ice was found beneath the solid ice cover. Ice rubble remained piled on the banks to a height of about 8 ft. as the result of the 17-18 Dec. 2003 thaw that broke up many rivers in Maine.

The following numbers are programmed into the ice motion detectors:

1-800-498-1930	Kennebec Sheriff's Dispatch
207 -626-2375	Augusta Dispatch
207-688-3224	NWS Gray, ME

I departed Augusta at 4:00 PM and arrived at Lebanon at 6:00 pm.

Respectfully Submitted,

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Fig. 1. Kennebec River at Augusta on 25 Feb. 2004 showing open lead downstream of new Third Bridge.

Fig. 2. New Third Bridge.

Fig. 3. Kennebec River upstream of Augusta, showing open leads in the vicinitiy of North Country Food Service.

Fig. 5. Looking downstream through "the rips", a fast-moving section of the Kennebec about 5 miles upstream of Augusta.

Fig. 6. Kennebec River on 25 Feb. 2004 showing open water extending for about 2 miles below Waterville.

Fig. 7. Sebasticook River entering the Kennebec at Winslow/Waterville

Fig. 8. Open lead below Benton Dam.

Fig. 9. Ft. Halifax Dam

Fig. 10. Ice motion detector near Maine State Housing in Augusta.

Fig. 11 Ice motion detector at the Sydney boat launch.